

# APPLICATION UNDER UNITED STATES PATENT LAWS

Atty. Dkt. No. 0305942

Invention: BROADCAST RECEIVING APPARATUS, CONTROL METHOD THEREOF, PORTABLE INFORMATION TERMINAL, AND CONTROL METHOD THEREOF

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## This is a:

- ☐ Provisional Application
- ☒ Regular Utility Application
- ☐ Continuing Application
  - ☐ The contents of the parent are incorporated by reference
- ☐ PCT National Phase Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application
- ☐ Substitute Specification
  - Sub. Spec Filed \_\_\_\_\_
  - in App. No. \_\_\_\_\_ / \_\_\_\_\_
- ☐ Marked up Specification re
  - Sub. Spec. filed \_\_\_\_\_
  - In App. No \_\_\_\_\_ / \_\_\_\_\_

## SPECIFICATION

# TITLE OF THE INVENTION

BROADCAST RECEIVING APPARATUS, CONTROL METHOD THEREOF,  
PORTABLE INFORMATION TERMINAL, AND CONTROL METHOD  
THEREOF

## 5 CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based upon and claims the  
benefit of priority from the prior Japanese Patent  
Application No. 2002-347499, filed November 29, 2002,  
the entire contents of which are incorporated herein by  
10 reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

This invention relates to a broadcast receiving  
apparatus, a broadcast receiving apparatus control  
15 method, a portable information terminal, and a portable  
information terminal control method, and more  
particularly to a system which harmonizes the function  
of receiving and reproducing broadcast content with a  
telephone function.

### 20 2. Description of the Related Art

In recent years, tremendous effort has been  
directed toward developing next-generation mobile  
terminals, including IMT (International Mobile  
Telecommunication)-2000 system compatible mobile phones  
25 and mobile satellite broadcasting compatible mobile  
television set.

Recently, it has been suggested that, as one of

the next-generation mobile terminal, a portable  
broadcast receiving apparatus for receiving mobile  
satellite broadcasting or ground wave digital  
broadcasting beamed to mobile terminals should be  
5 provided with a telephone function.

If a portable broadcast receiving apparatus is  
provided with a telephone function, what is important  
is how to deal with an incoming call in the middle of  
watching broadcast content. Under the present  
10 conditions, sufficient practical measures have not been  
taken against the problem.

Jpn. Pat. Appln. KOKAI Publication No. 2002-77458  
and Jpn. Pat. Appln. KOKAI Publication No. 2001-245024  
each have disclosed a configuration which interrupts  
15 the reproduction when there is an incoming call in the  
course of reproducing the content with the mobile phone  
and, after the call, resumes the reproduction of the  
content near the place where it was interrupted.

However, the former is based on the assumption  
20 that a system capable of requesting content delivery at  
any location from the delivery station is used. The  
latter is based on the assumption that the content  
recorded on the recording medium can be reproduced at  
any location. Neither the former nor the latter takes  
25 into account an incoming call in the middle of watching  
an ordinary TV broadcast.

# BRIEF SUMMARY OF THE INVENTION

According to an aspect of the present invention, there is provided a broadcast receiving apparatus including content reproducing means for receiving and reproducing broadcast content and talking means using a telephone line, the broadcast receiving apparatus comprising: recording means for, when there is an incoming call during the reproduction of the broadcast content, recording the received broadcast content onto a recording medium on the basis of a talk request; and recording and reproducing means for not only reproducing the broadcast content recorded on the recording medium on the basis of a reproduction request but also writing the received broadcast content over the area of the recording medium in which the reproduced broadcast content was recorded.

According to another aspect of the present invention, there is provided a broadcast receiving apparatus control method of controlling a broadcast receiving apparatus including content reproducing means for receiving and reproducing broadcast content and talking means using a telephone line, the broadcast receiving apparatus control method comprising: a step of reproducing the broadcast content received; a step of determining whether there is an incoming call during the reproduction of the broadcast content; a step of, when there is an incoming call, recording the received

broadcast content onto a recording medium on the basis of a talk request; and a step of not only reproducing the broadcast content recorded on the recording medium on the basis of a reproduction request but also writing  
5 the received broadcast content over the area of the recording medium in which the reproduced broadcast content was recorded.

According to still another aspect of the present invention, there is provided a portable information  
10 terminal comprising content reproducing means for receiving broadcast content and displaying an image and talking means using a telephone line, the portable information terminal further comprising: recording means, when there is an incoming call in the middle of  
15 displaying an image of the broadcast content, recording the received broadcast content onto a recording medium on the basis of a talk request; and recording and reproducing means for not only reading the broadcast content recorded on the recording medium and displaying  
20 an image on the basis of a reproduction request but also writing the received broadcast content over the area of the recording medium in which the broadcast content whose image was displayed was recorded.

According to still another aspect of the present  
25 invention, there is provided.

A portable information terminal control method of controlling a portable information terminal comprising

content reproducing means for receiving broadcast  
content and displaying an image and talking means using  
a telephone line, the portable information terminal  
control method comprising: a step of displaying an  
5 image of the broadcast content received; a step of  
determining whether there is an incoming call in the  
middle of displaying an image of the broadcast content;  
a step of, when there is an incoming call, recording  
the received broadcast content onto a recording medium  
10 on the basis of a talk request; and a step of not only  
reading the broadcast content recorded on the recording  
medium and displaying an image on the basis of a  
reproduction request but also writing the received  
broadcast content over the area of the recording medium  
15 in which the broadcast content whose image was  
displayed was recorded.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. 1 is an outside drawing to help explain a  
portable television broadcast receiving apparatus,  
20 which is an embodiment of the present invention;

FIG. 2 is a block diagram to help explain in  
detail the signal processing system of the portable  
television broadcast receiving apparatus according to  
the embodiment;

25 FIG. 3 is a block diagram to help explain in  
detail the video/audio recorder according the  
embodiment;

FIG. 4 is a flowchart to help explain the operation when there is an incoming call in the course of watching a television broadcast in the embodiment; and

5           FIG. 5 is a flowchart to help explain the operation when there is an incoming call in the course of watching a television broadcast in the embodiment.

#### DETAILED DESCRIPTION OF THE INVENTION

Hereinafter, referring to the accompanying  
10       drawings, an embodiment of the present invention will be explained in detail. FIG. 1 shows an outward appearance of a portable television broadcast receiving apparatus 11 to be explained in the embodiment. The broadcast receiving apparatus 11 is provided with the  
15       function of a mobile phone as a talking function using a telephone line.

In a body section 12 of the broadcast receiving apparatus 11, an antenna unit 13, a liquid-crystal display 14, an operation unit 15, a speaker unit 16, a  
20       microphone unit 17, and others are provided. The antenna unit 13 is configured to have a communication function and a television broadcast receiving function.

The operation unit 15 is composed of a power key 15a, a talk key 15b for starting to speak over the  
25       telephone, when there is an incoming call, a hold key 15c for ending the talk over the telephone, a control key group 15d for controlling various functions, a

numeric keypad 15e, and others.

FIG. 2 shows the configuration of signal processing system of the broadcast receiving apparatus 11. The broadcast receiving apparatus 11 is composed of a signal separator 18 connected to the antenna 13, a  
5 telephone unit 19, a TV receiver unit 20, a key input unit 21, an interface unit 22, and a microcomputer 23.

The telephone unit 19 has a signal processor 19a, a communication protocol processor 19b, and an applica-  
10 tion processor 19c. The TV receiver unit 20 has a video/audio processor 20a, a decoder 20b, a video/audio recorder 20c, and a display processor 20d.

The interface unit 22 is composed of the liquid-crystal display 14, operation unit 15 (in FIG. 2, only  
15 the talk key 15b and hold key 15c are shown), speaker unit 16, microphone unit 17, and others.

In such a configuration, the telephone function will be explained. An incoming call signal received by the antenna 13 is supplied from the signal separator 18  
20 to the telephone unit 19. In the telephone unit 19a, the signal processor 19a demodulates the inputted incoming call signal and outputs the resulting signal to the microcomputer 23.

When sensing an incoming call, the microcomputer  
25 23 outputs an incoming call notice signal to the application processor 19c. Receiving the incoming call notice signal, the application processor 19c outputs



incoming call display data via the display processor 20d to the liquid-crystal display 14. Then, the incoming notice is displayed on the screen of the liquid-crystal display 14.

5           At the same time, the application processor 19c outputs incoming call audio data to the speaker 16. The speaker 16 then produces a ringtone.

          When the user operates the talk key 15b in response to the incoming call, the operation  
10       information is supplied via the key input unit 21 to the microcomputer 23. Receiving the operation information, the microcomputer 23 performs control not only so that the audio signal from the calling party received by the antenna 13 may be processed at the  
15       signal processor 19a, communication control protocol processor 19b, and application processor 19c and then reproduced at the speaker 16 but also so that the user's speech may be processed at the microphone 17, application processor 19c, communication protocol  
20       processor 19b, signal processor 19a, and signal separator 18, and then transmitted from the antenna 13. As a result, a talk with the calling party is allowed.

          When the user operates the hold key 15c, the operation information is inputted via the key input  
25       unit 21 to the microcomputer 23. Receiving the operation information, the microcomputer 23 determines that the call is finished, controls the telephone unit

19 into an incoming call waiting state, and ends the process.

Next, the television broadcast receiving function will be explained. A television broadcast signal  
5 received by the antenna 13 is tuned by the signal separator 18 according to the tuning operation at the operation unit 15 and then is supplied to the TV receiver unit 20.

In the TV receiver unit 20, the inputted  
10 television broadcast signal is demodulated at the video/audio processor 20a. The decoder 20b subjects the demodulated signal to an expansion process and other processes and supplies the resulting video and audio data to the video/audio recorder 20c.

15 As shown in FIG. 3, the video/audio recorder 20c is composed of a buffer 20c1 and a recording medium 20c2, such as a hard disk, for recording the data held in the buffer 20c1.

When an ordinary television broadcast is  
20 reproduced, the video data and audio data inputted to the video/audio recorder 20c are outputted as they are via the buffer 10c1, that is, they are outputted without being recorded onto the recording medium 20c2.

Then, the video data outputted from the  
25 video/audio recorder 20c is displayed via the display processor 20d on the screen of the liquid-crystal display 14. The audio data outputted from the

video/audio recorder 20c is reproduced at the speaker 16. As a result, the television broadcast is reproduced.

5       The following is an explanation of the operation when there is an incoming call in the course of reproducing a television broadcast. As described above, the incoming call signal received by the antenna 13 is separated by the signal separator 18 and is demodulated by the signal processor 19a of the  
10      telephone unit 19. The demodulated signal is outputted to the microcomputer 23.

      When sensing an incoming call, the microcomputer 23 outputs an incoming call notice signal to the application processor 19c. Receiving the incoming call  
15      notice signal, the application processor 19c outputs incoming call display data via the display processor 20d to the liquid-crystal display 14. Then, the incoming notice is displayed on the liquid-crystal display 14 in such a manner that the notice is  
20      superposed on the television broadcast image.

      At the same time, the application processor 19c outputs incoming call audio data to the speaker 16. The speaker 16 then produces a ringtone in such a manner that the sound is superposed on the television  
25      broadcast sound.

      To respond to the incoming call, the user operates the talk key 15b. Then, the operation information is

supplied via the key input unit 21 to the microcomputer 23. At this time, the microcomputer 23 determines that the communication mode turns on and outputs a record start signal to the video/audio recorder 20c.

5           Then, the video/audio recorder 20c operates so as to record the video data and audio data inputted to the buffer 20c1 onto the recording medium 20c2 without outputting the video and audio data to the interface unit 22.

10           Having determined that the communication mode has been turned on, the microcomputer 23 brings the telephone unit 19 into the busy state as explained in the telephone function. As a result, the reproduction of the television broadcast is interrupted and the talk  
15           with the calling party is realized.

          When the user operates the hold key 15c after finishing the talk, the operation information is inputted via the key input unit 21 to the microcomputer 23. Then, the microcomputer 23 determines that the  
20           talk has been finished and brings the telephone unit 19 into the incoming call waiting state.

          At this time, the microcomputer 23 outputs a reproduction start signal to the video/audio recorder 20c. Then, the video/audio recorder 20c reads the  
25           video data and audio data recorded in the recording medium 20c2 according to the recorded time sequence and overwrites sequentially the recording area from which

the data was read with the new video data and audio data obtained from the decoder 20b. That is, time-slipped reproduction is carried out.

As a result, the reproduction of the broadcast content following the broadcast content at the time when the reproduction was interrupted is started at the time when the hold key 15c is operated after the user has finished the talk. This helps prevent the user to miss the middle part of the broadcast content because of the call.

When there is an incoming call, the user just operates the talk key 15b, with the result that the television broadcast receiving function is switched to the telephone function automatically and the video data and audio data are recorded automatically. After finishing the call, the user just operates the hold key 15c, with the result that the telephone function is switched to the television broadcast receiving function automatically and the video data and audio data are reproduced automatically. This makes it easy for the user to handle the apparatus.

FIGS. 4 and 5 are flowcharts to help explain the operations when there is an incoming call while the user is watching television. First, when control is started (step S1) in the middle of reproducing a television broadcast, the microcomputer 23 determines in step S2 whether there is an incoming call. If there

is an incoming call (YES), the microcomputer 23 determines in step S3 whether there is a talk request, that is, whether the talk key 15b has been operated.

5 If a talk request is made (YES), the microcomputer 23, in step S4, causes the video/audio recorder 20c to start a recording operation. At this time, the microcomputer 23 calculates the maximum recordable time X (minutes) of the video and audio data from the remaining recording capacity of the recording  
10 medium 20c2.

Thereafter, in step S5, the microcomputer 23 determines whether the call was finished within the time  $X - 0.5$  (minutes) obtained by subtracting a specific reference time (e.g., 0.5 minute) from the  
15 maximum recordable time X (minutes), that is, whether the hold key 15c was pressed within  $X - 0.5$  (minutes) since the talk was started.

If the talk is not finished (NO), the micro-computer 23, in step S6, gives a warning to the user.  
20 The warning is given by, for example, displaying such a message as "the capacity is full" on the liquid-crystal display 14, causing the speaker 16 to produce a specific voice message or a warning sound, or vibrating the apparatus 11.

25 Thereafter, in step S7, the microcomputer 23 determines whether the talk was finished within the maximum recordable time X (minutes). If the talk was

finished within the maximum recordable time X (minutes) (YES), or if the talk was finished within the maximum recordable time X - 0.5 (minutes) in step S5 (YES), the microcomputer 23, in step S8, reads the video data and audio data recorded on the recording medium 20c2, according to the time sequence in which the recording was done, and reproduces them.

As a result, the reproduction is started from the part where the reproduction of the television broadcast content was interrupted. Also in step 8, the recording medium 20c2 is overwritten with new video data and audio data sequentially, thereby carrying out follow-up reproduction as described earlier.

Thereafter, the microcomputer 23, in step S9, determines whether there is an incoming call again in the middle of reproducing the television broadcast. If there is an incoming call again (YES), the microcomputer 23 determines in step S10 whether the user talks over the telephone.

If the user talks over the telephone (YES), the microcomputer 23 returns control to step S4. If the user does not talk over the telephone (NO), the microcomputer 23, in step S11, continues the time-slipped reproduction of the recording medium 20c2 in step S8.

In addition, if there is not an incoming call again in the middle of reproducing the television

broadcast in step S9 (NO), the microcomputer 23, in step S12, determines whether a request to stop the reproduction of the video data and audio data from the recording medium 20c2 has been made.

5        If a request to stop the reproduction has not been made (NO), the microcomputer 23 returns control to step S9. If a request to stop the reproduction has been made (YES), the microcomputer 23 switches to the operation of reproducing the television broadcast  
10       content now on the air.

      If the talk was not finished within the maximum recordable time X (minutes) in step S7 (NO), the microcomputer 23, in step S14, continues recording the video and audio data exceeding the maximum recordable  
15       time X (minutes) in such a manner that the area in which the old video data and audio data are written are overwritten sequentially with the exceeding video and audio data.

      Thereafter, the microcomputer 23, in step S15, determines whether to reproduce the contents recorded  
20       on the recording medium 20c2. The determination is made by displaying, for example, the message "Although the television program is not continuous, do you want to reproduce it?" on the liquid-crystal display 14 and  
25       prompting the user to operate the key corresponding to YES or NO in the operation unit 15.

      If reproduction is requested (YES), the



microcomputer 23, in step S16, starts to reproduce the oldest video data and audio data recorded on the recording medium 20c2. In this case, too, follow-up reproduction is carried out.

5        If reproduction is not requested (NO), the microcomputer 23, in step S17, erases the contents recorded on the recording medium 20c2 and switches to the operation of reproducing the television broadcast content now on the air.

10        In the aforementioned operation, when the talk is not finished within the time  $X - 0.5$  (minutes) obtained by subtracting a specific reference time (e.g., 0.5 minute) from the maximum recordable time  $X$  (minutes), a warning is given to the user. This  
15        enables the user to recognize the talk end timing that prevents the user from missing the middle part of the broadcast content, which is convenient for the user.

When the portable television broadcast receiving apparatus 11 has the function of accessing the  
20        Internet, the recording medium 20c2 can also serve as a recording medium for recording the data downloaded from the Internet.

In this case, according to the amount of data  
downloaded from the Internet, the maximum recordable  
25        time  $X$  (minutes) when there is an incoming call during the reproduction of the television broadcast increases or decreases. That is, if necessary, the user can

determine whether to increase the amount of data downloaded from the Internet or lengthen the maximum recordable time X (minutes). In this respect, the apparatus is convenient for the user to use.

5           In a state where the talk is finished and the follow-up reproduction of the broadcast content recorded on the recording medium 20c2 is carried out, it is possible to catch up with the current television broadcast by fast-forwarding, for example, the  
10 unnecessary parts (the scenes the user does not want to watch) and thereby decreasing the amount of data recorded on the recording medium 20c2 sequentially.

          Furthermore, the broadcast receiving apparatus 11 can also has the function of not only recording and  
15 reproducing the data onto and from the recording medium 20c2 but also carrying out fast-forward, fast-rewind, high-speed reproduction, slow reproduction, or temporary stop according to the user's operation.

          In addition, the received broadcast content may be  
20 recorded into or reproduced from the video/audio recorder 20c, even when the user is not talking over the telephone.

          With the above configuration and method, when  
25 there is an incoming call in the middle of reproducing the broadcast content, the received broadcast content is recorded onto the recording medium on the basis of a talk request, the broadcast content is reproduced from

the recording medium on the basis of a reproduction request, and the area of the recording medium in which the reproduced broadcast content was recorded is overwritten with the received broadcast content.

5           As a result, when the talk is finished, the reproduction of the broadcast content following the one at the time when the talk was requested is started, which helps prevent the user from missing the middle part of the broadcast content because of the talk.  
10          This makes it possible to deal at a sufficiently practical level with an incoming call received during the reproduction of broadcast content.

          While the description above refers to a particular embodiment of the present invention, it will be  
15          understood that many modifications may be made without departing from the spirit thereof. The accompanying claims are intended to cover such modifications as would fall within the true scope and spirit of the present invention. The presently disclosed embodiment  
20          is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, rather than the foregoing description, and all changes that come within the meaning and range of equivalency  
25          of the claims are therefore intended to be embraced therein.

          As described in detail, with an embodiment of

the present invention, it is possible to provide an  
excellent broadcast receiving apparatus, a control  
method thereof, a portable information terminal, and a  
control method thereof which make it possible to deal  
5 at a sufficiently practical level with an incoming call  
received during the reproduction of broadcast content.